
Graduate Certificate in Mining Engineering

Surface Mining Methods and Equipment

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Surface mining is a mining method used to extract mineral resources that are near the surface of the earth. This method is different from underground mining, where minerals are extracted from deep within the earth. Surface mining is commonly used for mining coal, copper, iron, gold, and other minerals.

Key Terms and Concepts

1. **Stripping Ratio:** The stripping ratio is the ratio of overburden to ore or coal in a surface mining operation. It is a crucial factor in determining the economic feasibility of a mining project. A lower stripping ratio indicates a more economically viable project.
2. **Overburden:** Overburden refers to the material that lies above the mineral deposit being mined. It includes soil, rock, and other materials that must be removed to access the mineral resource. Overburden removal is a significant part of surface mining operations.
3. **Pit:** A pit is an excavation or cut made in the earth to extract mineral resources. It is a common feature of surface mining operations and can vary in size and shape depending on the type of mineral being mined.
4. **Bench:** A bench is a step-like excavation in a pit that allows for easier access to the mineral deposit. Benches are typically created by removing overburden in a series of horizontal layers.
5. **Haul Roads:** Haul roads are roads used to transport materials within a mining site. They are essential for moving overburden, ore, and equipment around the site efficiently.
6. **Dragline:** A dragline is a large excavating machine used in surface mining operations. It is equipped with a bucket attached to a long boom that can be lowered and raised to scoop up material from the pit.
7. **Bucket-Wheel Excavator:** A bucket-wheel excavator is a heavy piece of machinery used in surface mining to remove overburden. It has a rotating wheel with buckets attached to it that scoop up material as the wheel turns.
8. **Truck and Shovel:** The truck and shovel method is a common surface mining technique where trucks and shovels are used to remove overburden and transport materials within the mining site. Trucks haul the material away from the pit, while shovels load the trucks with material.
9. **Highwall Mining:** Highwall mining is a method of extracting coal from the high walls of an open pit mine after the mining operation has been completed. It allows for the recovery of additional coal reserves that

would otherwise be left behind.

10. Reclamation: Reclamation is the process of restoring land that has been disturbed by mining activities to its original or a suitable condition. It includes regrading the land, planting vegetation, and ensuring that the site is safe and environmentally sound.

Practical Applications

Surface mining methods and equipment are used in various mining operations around the world. For example, in coal mining, surface mining is often used to extract coal deposits that are close to the surface. The truck and shovel method is commonly employed in these operations due to its efficiency in removing overburden and transporting materials.

In copper mining, large-scale open pit operations are common, where draglines and bucket-wheel excavators are used to extract the ore. These machines are capable of moving vast amounts of material quickly and efficiently, making them ideal for large mining projects.

Gold mining also utilizes surface mining methods, particularly in open pit mines. Haul roads are crucial for transporting ore and equipment within the mine, while reclamation efforts are essential to restore the land once mining activities have ceased.

Challenges

Despite its widespread use, surface mining methods and equipment present several challenges that must be addressed by mining engineers and operators. Some of the key challenges include:

1. **Environmental Impact:** Surface mining can have a significant impact on the environment, including habitat destruction, water pollution, and soil erosion. Proper planning and reclamation efforts are essential to minimize these impacts.
2. **Safety Concerns:** Surface mining operations can be hazardous due to the large equipment, steep slopes, and unstable ground conditions. Ensuring the safety of workers and equipment is a top priority for mining companies.
3. **Cost Management:** Surface mining operations can be costly due to the equipment, labor, and infrastructure required. Managing costs effectively is crucial to the economic viability of a mining project.
4. **Regulatory Compliance:** Surface mining operations are subject to various regulations and permitting requirements to protect the environment and ensure the safety of workers. Compliance with these regulations is essential to avoid fines and penalties.
5. **Community Relations:** Surface mining operations can impact local communities through noise, dust, and traffic. Building positive relationships with local residents and stakeholders is crucial for the long-term

success of a mining project.

In conclusion, surface mining methods and equipment play a vital role in extracting mineral resources from the earth. Understanding key terms and concepts in surface mining is essential for mining engineers and operators to successfully plan and execute mining projects. By addressing challenges such as environmental impact, safety concerns, cost management, regulatory compliance, and community relations, mining companies can ensure the sustainable and responsible extraction of mineral resources for future generations.